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PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE HONORABLE BOARD OF PATENT APPEALS AND

INTERFERENCES

In re the Application of

Steven J. Harrington

Confirmation No. 3224

Application No.: 09/851,210

Examiner: James A. Thompson

Filed: 05/07/2001

Docket No.: 98258-US-NP

For: **METHOD FOR COLOR HALFTONING WHEN UTILIZING REDUNDANT COLOR INKS**

BRIEF ON APPEAL

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Appeal from Group 2624

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I. REAL PARTY IN INTEREST

The real party in interest for this appeal and the present application is Xerox Corporation, by way of an Assignment recorded in the U.S. Patent and Trademark Office at Reel 014401, Frame 0422-0423.

II. STATEMENT OF RELATED APPEALS AND INTERFERENCES

There are no prior or pending appeals, interferences or judicial proceedings, known to Appellant, Appellant's representative, or the Assignee, that may be related to, or which will directly affect or be directly affected by or have a bearing upon the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

Claims 1-16 are on appeal.

Claims 1-16 are rejected.

IV. STATUS OF AMENDMENTS

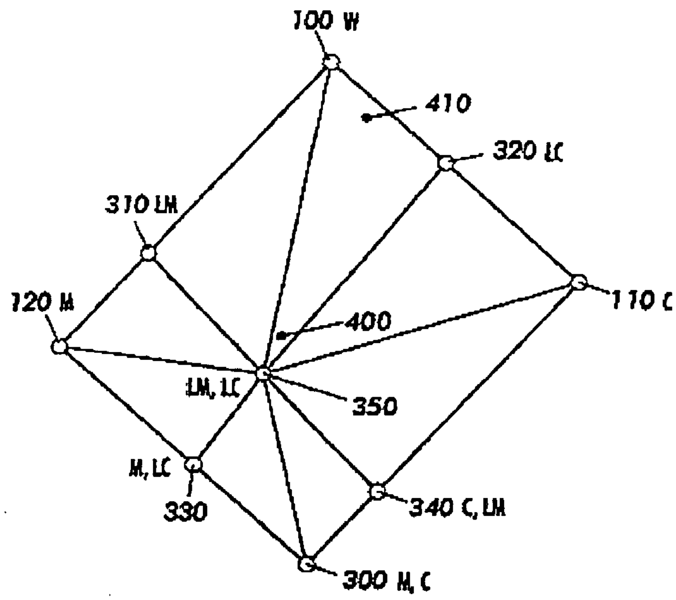
No Amendment After Final Rejection has been filed.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The subject matter of independent claims 1, 8 and 13, is directed to the utilization of redundant color inks with a methodology for identifying which ink combination from a multitude of possible choices is best utilized in rendering a given image (see page 1, lines 16-18, of the Specification as filed). As is well understood by those skilled in the art, to produce a desired color one can identify a tetrahedron in color space that contains the desired color. One can then produce the desired color by a proper combination of the four vertex colors that define that tetrahedron.

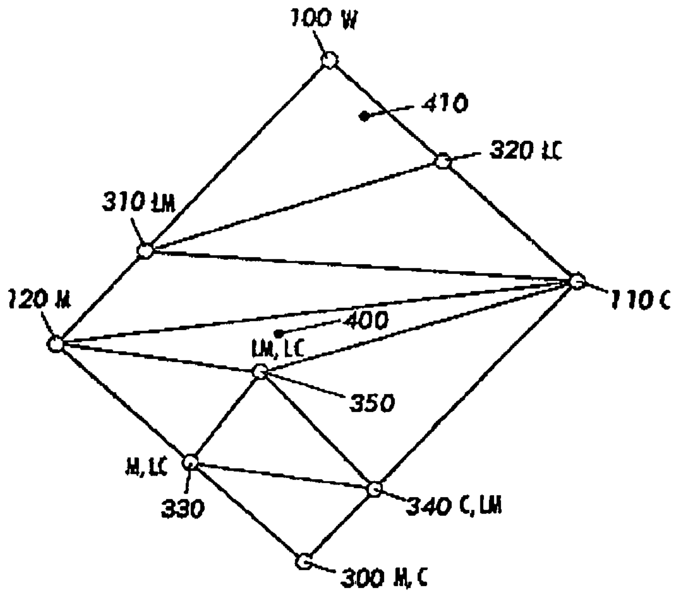
In general, there can be many possible tetrahedra that enclose a given desired color point. As is taught by the Applicant, **the best tetrahedron for such a point is the one that has most nearly the same luminance for all of its vertices.** This will minimize the luminance contrast in the halftone pattern that produces the desired color (see page 6 lines 21-24, of the Specification as filed). So the problem is then to tessellate (divide-up) color space into tetrahedra such that the vertices of the individual tetrahedra have localized luminance values (see page 6 lines 27-28, of the Specification as filed).

Figure 4 depicts an undesirable tessellation approach applied to a two-dimensional color plane. [The color space has been canted slightly to emphasize the depiction of luminance variation by placing the highest points of luminance at the top, and the lowest points at the bottom of the depiction. The top of the data at vertex 100 being the lightest and the bottom of the diagram at vertex 300 being the darkest end of available luminance variations.]



The tessellation employed here consists of breaking-up the color space by defining non-overlapping boundaries running from the center vertex 350 light-magenta light-cyan, and radiating out to all other ink color vertices as shown in Figure 4. A non-overlapping approach is preferred so as to eliminate ambiguity as to what region a data point lies within. However, this technique as discussed above, undesirably creates tessellation regions which as illustrated here may span more than half the available luminance range. One example is the region defined by the three vertices white 100, light-cyan 320 and light-magenta light-cyan 350. A region arranged as such means that color halftone dots which land in this region will be made up of smaller spots of the above three colorants. **These three colorants are far enough apart in luminance to create a grainy texture, and be unpleasant and distracting to the eye.** In this example color points 400 and 410 are in this same region as a result of this tessellation approach even though they are quite far apart in luminance (see from page 7, line 20 – to page 8, line 3, of the Specification as filed).

Figure 5 a provides a preferred second tessellation approach applied to the same two-dimensional color plane.



With this exemplary non-overlapping tessellation scheme color points 400 and 410 as shown in Figure 5 are now not only in separate regions but those regions have two intervening tessellated regions between them. Color point 400 is in the region delineated by colorants cyan 110, magenta 120, and light-magenta light-cyan 350. Color point 410 is in the region delineated by colorants white 100, light-magenta 310, and light-cyan 320. **The colorants that are now utilized to create the color dots to represent these color points are much closer in luminance and will therefore combine and blend in a manner much more pleasing to the eye.** The redundant ink colorant tessellation as applied here in Figure 5 has been arranged to minimize the range of luminance variation in the regions. **This is achieved by creating region boundaries that are predominately orthogonal to the axis of luminance** (see page 8, lines 14-25 of the Specification as filed).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The following grounds of rejection are presented for review:

Claims 1-3 and 5-16 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,390,035, to Kasson et al. (hereinafter Kasson) in view of U.S. Patent No. 5,982,990, to Gondek (hereinafter Gondek).

Claim 4 is rejected under 35 U.S.C. §103(a) as being unpatentable over Kasson in view of Gondek and U.S. Patent No. 5,553,199, to Spaulding, et al. (hereinafter Spaulding).

VII. ARGUMENT

A. Claims 1-3 and 5-16 Would Not Have Been Obvious Over Kasson in View of Gondek

Claims 1-3 and 5-16 are rejected under 35 U.S.C. §103(a) as being unpatentable over Kasson in view of Gondek.

Kasson is provided as disclosing tessellating the available color space into regions. Kasson as stated by the Examiner, does not show said color space as defined by redundant color inks, but Gondek does, or so states the Office Action.

Problematically, neither Kasson or Gondek, alone or in combination, teach or suggest the Applicant's invention. Thus the Applicant is faced with the conundrum of positively proving a negative. That is, proving that something which is not in there, is not in there.

Kasson fails to provide the necessary teaching needed to make out the requirements of a prima facie case of obviousness. In essence Kasson is directed to the problem of converting image data from one color space representation into another color space representation. Kasson in particular is focused on the problem of translating RGB color space as used in display monitors, into CMYK color space as used for printing, or other color space such as CIE L*a*b*. The Examiner allows that Kasson fails to provide teaching directed to redundant color inks, and the Applicant agrees. However, **Kasson also fails to teach the importance of tessellation (dividing-up) of color space with regards to minimization of luminance variation as when that tessellation is necessarily defined by redundant**

color inks, as is described above by the Applicant in the discussion of Figures 4 and 5 from the Specification as filed. Indeed Kasson fails to provide any discussion (let alone a teaching) of luminance in any manner at all. Further, **Kasson fails to provide any teaching directed to the tessellation of color space as defined by redundant color inks.**

The Examiner argues as stated on page 4, lines 12-16 of the office action, dated 23 November 2004: "A close-packing format packs the tetrahedra efficiently (column 11, lines 48-53 of Kasson), thus minimizing the variations in each dimension (column 14, lines 3-9 of Kasson)".

Actually the Examiner's cite to column 11, lines 48-53 of Kasson provides:

> The present invention provides an advantageous packing method which may be implemented according to a first and/or a second alternative. A first alternative for packing octahedra and tetrahedra into the rectangular volume 10 is illustrated in FIG. 2. This volumetric packing technique is based upon the use of a planar grid of points which form layer i.

There is no mention of efficiently doing anything here, or of minimizing variation. And the cite to column 14, lines 3-9 of Kasson provides:

> The subdivision of FIG. 7 was produced using the first alternative of the volumetric packing technique in order to *minimize* the distortion of the domain space from regular tetrahedra. In this example, the domain space may be conceptualized as being packed with a plurality of tetrahedra and octahedra, such that each octahedron contains four tetrahedra.

(emphasis added by the applicant)

The minimization described by Kasson here is to minimizing distortion, not variations in each dimension.

The Examiner further argues Kasson as stated on page 5, lines 7-11 of the final office action, dated 10 June 2005 that: "Since the regions are arranged in a compact packing form (figure 2 and column 11, lines 28-35 of

Kasson), said regions are therefore arranged so as to minimize the range of luminance variation found within the regions."

The Examiner's cite to column 11, lines 28-35 of Kasson provides:

> Each of the rectangular volumes are then subdivided into octahedra and tetrahedra which exhibit a hexagonal, *close-packing structure*. An example of this subdivision is shown in FIG. 2, where a rectangular volume 10 is divided into tetrahedral volumes. The packing arrangement shown in FIG. 2 is for illustrative purposes only; it is possible to pack each rectangular volume with other quantities of tetrahedra, and it is possible to adopt other geometrical arrangements of the tetrahedra within the rectangle.

There is no mention here of luminance variation. This "close-packing structure" within the context of Kasson as will be understood by those skilled in the art, relates to tessellation with tetrahedra which completely fill and do not overlap the color space. See for example, Kasson column 4, lines 14-16 which provide:

> The operation of selecting sample points in the continuous input domain of the function can be termed packing or subdividing.

And Kasson column 4, lines 39-42 which provide:

> However, it is necessary that the collection of solids chosen for packing be non-overlapping and completely fill the portion of the function domain for which approximations are desired.

In no way does this "close-packing structure" teach minimizing the range of luminance variation found within the regions, let alone provide the Applicant's teaching of the importance of tessellation (dividing-up) of color space with regards to minimization of luminance variation when that tessellation is necessarily defined by redundant color inks. Nor does this "close-packing structure" provide the Applicant's teachings directed to the tessellation of color space as defined by redundant color inks.

It would seem that the thrust of the Examiner's argument is directed to "inherency" as evident from page 2, line 29 through page 3, line 8, of the final office action dated 10 June 2005, which states: "Due to the *inherent* relationship between luminance (in one of the many types of color spaces, such as CIELab, in which luminance is a coordinate variable) and the color values of any of the various color spaces that use specific colors to define color space coordinates, an efficiently close-packed format of tetrahedra for the color space will minimize the range of luminance. By three-dimensionally minimizing the variations in color, the luminance, which is directly related to and functionally dependent upon the color values, is also minimized."

It appears that the Examiner has confused the truth of a technical relationship inherent amongst coordinate variables, of which he is correctly aware, for the teaching of Applicant's invention within Kasson. Only with impermissible hindsight by including knowledge gleaned only from the Applicant's disclosure could such a teaching be found by the Examiner. See In Re McLaughlin, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Furthermore, it is long established that inherency and obviousness are entirely distinct concepts. See, e.g., In re Rinehart, 531 F.2d 1048 (C.C.P.A. 1976); Ex parte Wisdom et al., 184 U.S.P.Q. 822 (P.O.B.A. 1973). As the Federal Circuit Court stated in In re Newell, 891 F.2d 899 (Fed. Cir. 1989), "A retrospective view of inherency is not a substitute for some teaching or suggestion that supports the selection and use of the elements in the particular claimed invention. In deciding that a novel combination would have been obvious, there must be supporting teaching in the prior art; *for that which may be inherent is not necessarily known, and obviousness cannot be predicated on what is unknown.*"

The secondary reference, Gondek, is directed to an ink-jet printing system and method employing two groupings of inks, low dye and high dye. Gondek teaches transitioning between these two sets at established control points which are empirically determined (column 7 lines 49-54). Thus there is no teaching to a tessellation of color space, where the redundant inks are employed at the vertices of tetrahedra as taught by the Applicant. There are no teachings directed to the tessellation of color space as defined by redundant color inks. Nor does Gondek provide the Applicant's teaching of the importance of tessellation (dividing-up) of color space with regards to minimization of luminance variation when that tessellation is necessarily defined by redundant color inks. Gondek can only stand as teaching redundant inks. Thus Gondek fails to provide for what Kasson fatally lacks. Kasson can only stand as teaching tessellating color space in a regular tiled volumetric way (see Kasson column 12 lines 57-64). Therefore Kasson fails to provide what Gondek lacks. Further, neither Kasson or Gondek in any combination provide the Applicant's entire teaching in whole as claimed.

Further, neither Kasson or Gondek in any combination suggest their combination. How can they? There can be no suggestion to combine that (teaching) which is absent. Indeed, the most careful read-through of Kasson and Gondek fail to provide any such suggestion or motivation.

Only with impermissible hindsight by including knowledge gleaned only from the Applicant's disclosure could such a teaching be found. See In Re McLaughlin, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). It is impermissible to use the claims as a frame and the prior art references as a mosaic to piece together a facsimile of the claimed invention. Uniroyal Inc. v. Rudkin Wiley Corp., __ F. 2d __, 5 U.S.P.Q. 2d 1435 (Fed. Cir. 1988); W. L. Gore and

Associates, Inc. v. Garlock, Inc., 721 F. 2d 1540, 220 U.S.P.Q. 303 (Fed. Cir. 1983). The Examiner clearly appears to have considered various portions of the references cited, in each instance viewing the cited portion in isolation from the context of the entire reference, and combined these isolated portions to arrive at the present invention with the benefit of hindsight. Using hindsight or applying the benefit of the teachings of the present application when determining obviousness, however, is impermissible; the references applied must be reviewed without hindsight, must be reviewed as a whole, and must suggest the desirability of combining the references. Lindemann Maschinenfabrik v. American Hoist & Derrick Co., 221 U.S.P.Q. 481 (Fed. Cir. 1984). No complete teaching has been found, and no suggestion to combine has been found. Thus the prima facie case of obviousness has not been made.

B. Claim 4 Would Not Have Been Obvious Over Kasson in View of Gondek and Spaulding

Claim 4 is rejected under 35 U.S.C. §103(a) as being unpatentable over Kasson in view of Gondek and Spaulding.

Spaulding is cited by the Examiner as disclosing tetrahedral regions (Figure 3; Figure 9; and column 5, lines 36-44) that are arranged so that region boundaries are predominately orthogonal to the axis of luminance, as seen in Figure 5 of Spaulding.

Spaulding does not so teach and therefore a prima facie case for obviousness is not met.

Actually in truth, Figure 3 simply depicts how a cube 14 may be broken into six tetrahedrons 16. (Please see column 2, lines 24-26, of Spaulding). The Examiner's citation to column 5, lines 36-44 points simply to discussion of the employment of that concept to inverse interpolation. This has little or nothing to do with tetrahedral regions arranged so that region boundaries are predominately orthogonal to the axis of luminance.

Further, Figure 5 of Spaulding shows a typical overall color gamut for a 4-color device. (Please see column 2 lines 66-67 and lines 49-52). The entire printer gamut is depicted. As such it is not tessellated. As such Figure 9, which does depict tessellation, provides very large sub-gamuts (see column 5, line 65 – column 6, line 1) which encompass almost the entire available luminance range in direct contradiction to the Applicant's claim to "to minimize the range of luminance variation found within the regions".

Spaulding thus actually teaches away from the Applicant's invention. Clearly a prima facie case of obviousness has not been met.

VIII. CONCLUSION

For all of the reasons discussed above, it is respectfully submitted that the rejections are in error and that claims 1-16 are in condition for allowance. For all of the above reasons, Appellants respectfully request this Honorable Board to reverse the rejections of claims 1-16.

Respectfully submitted,

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CLAIMS APPENDIX

CLAIMS INVOLVED IN THE APPEAL:

1. (Original) A method for utilizing redundant color inks, comprising:
tessellating the available color space as defined by the redundant color inks into regions where the regions are arranged so as to minimize the range of luminance variation found within the regions.

2. (Previously Presented) The method of claim 1 further comprising:
overlaying the tessellated color space result from the prior tessellating step with interpolation points so as to create an overlay lookup table.

3. (Previously Presented) The method of claim 2 further comprising:
applying image data to the overlay lookup table to point to which redundant color inks to select and provide the amounts to use of the selected redundant color inks.

4. (Original) The method of claim 1 wherein the regions are arranged so that region boundaries are predominately orthogonal to the axis of luminance.

5. (Original) The method of claim 3 wherein the amounts are interpolated from the interpolation points stored in the overlay lookup table.

6. (Original) The method of claim 5 wherein the interpolation is performed by calculating the volume of tetrahedra formed by the interpolation points.

7. (Original) The method of claim 1 wherein the regions are non-overlapping.

8. (Original) A method for utilizing redundant color inks having a given color space, comprising:

tessellating the color space so as to minimize luminance variation in the redundant color inks utilized.

9. (Original) The method of claim 8 wherein the tessellation is achieved by:

sorting the redundant color inks by order of luminance from the darkest to the lightest,

adding the redundant color inks as points to the color space and connecting the points in the sorted order so as to create tetrahedral tessellated regions.

10. (Original) The method of claim 9 wherein the regions are non-overlapping.

11. (Previously Presented) The method of claim 10 further comprising:

overlaying the tessellated color space with interpolation points so as to create an overlay lookup table.

12. (Previously Presented) The method of claim 11 further comprising:

applying image data to the overlay lookup table to point to which redundant color inks to select and provide the amounts to use of the selected redundant color inks.

13. (Original) A method for utilizing redundant color inks having a given color space to image data in a printer, comprising:

tessellating the color space so as to minimize luminance variation in the redundant color inks utilized by:

sorting the redundant color inks by order of luminance from the darkest to the lightest and

connecting the redundant color inks in the sorted order across the color space so as to create tetrahedral non-overlapping tessellated regions.

14. (Previously Presented) The method of claim 13 further comprising:

overlaying the tessellated color space with interpolation points so as to create an overlay lookup table.

15. (Previously Presented) The method of claim 14 further comprising:

applying image data to the overlay lookup table to point to which redundant color inks to select and provide the amounts to use of the selected redundant color inks.

16. (Original) The method of claim 13 wherein if creating a tetrahedral non-overlapping tessellated region results in a concave shape then additional tetrahedral non-overlapping tessellated regions are added to fill the cavity and maintain a convex construction.

EVIDENCE APPENDIX

NONE

RELATED PROCEEDINGS APPENDIX

NONE